

# Silver nanoparticle Plasmon Effect in the luminescence of X%Ag<sup>0</sup>@7.5%Eu(tta)<sub>3</sub>·TOPO-PVP system.

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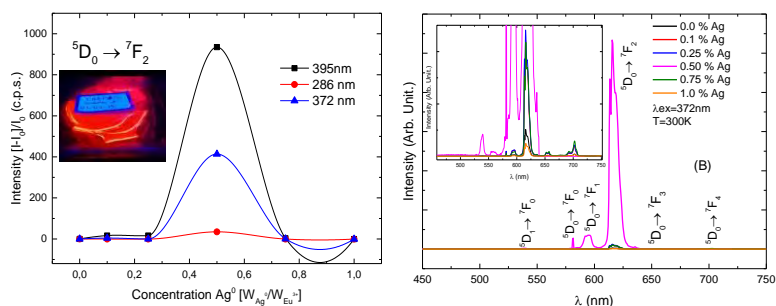
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Surface Plasmon's (SP) are known as collective oscillations of the conduction electrons induced by incident light at a metallic interface. They attract increasing interest for their applications to surface enhanced Raman spectroscopy (SERS), metal enhanced fluorescence (MEF), non-linear optics (NLO), etc. In the MEF fluorophores are not covalently coupled to the silver nanoparticles, which can facilitate the control of the fluorophores-to-metal separation, using a polymer thin film as the spacer, to study this phenomenon. Nowadays Plasmon coupled RE ion systems are of great scientific significance [1-2].

In this work, the polyvinylpyrrolidone polymer, PVP, powder (0.3 g) was dissolved in ethanol or water (50 mL) followed by the addition of the required amount (from 7.5% in mass) of the Ln<sup>3+</sup>-complex in ethanol and added 0.1-10%(w/w) of Ag<sup>0</sup> nanoparticles in relation of Eu<sup>3+</sup> mass. The mixed solution was stirred (30 minutes), then cast onto a Petri dish. The polymer film was obtained after the total evaporation of the solvent. These films were characterized using IR spectroscopy, XPD, TGA, TEM, absorption and photoluminescence spectroscopy.

The luminescence spectra of the films doped with Ag<sup>0</sup> have the same profile of-undoped films, exhibiting characteristic bands assigned to <sup>5</sup>D<sub>0</sub>→<sup>7</sup>F<sub>J</sub> (J= 1-4) at 581, 596, 615 and 702 nm. The intensity parameters of the film with and without Ag<sup>0</sup> in various concentrations of metallic nanoparticle were determined. The only difference in these systems remaining in the intensity of the bands of Eu<sup>3+</sup> ion that increase in a factor of ~1000X (Fig. 1).

Fig. 1. Plotter of Intensity versus concentration of Ag<sup>0</sup> (A) inside image of the film under UV irradiation and Emission spectra of the PVP:7.5%Eu(tta)<sub>3</sub>(TPPO)<sub>2</sub> under excitation at 372 nm (B).



Keywords: Europium luminescence, silver nanoparticles, plasmon effect, PVP.

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## References

- [1] R. Reisfeld, T. Saraidarov, G. Panzer, V. Levchenko, M. Gaft, Opt. Mater. 34 (2011) 351–354.
- [2] R. Reisfeld, V. Levchenko, Opt. Mat. 63 (2017) 88–94.
- [3] M. A. Couto dos Santos, O. L. Malta, R. Reisfeld, J. Lumin. 170(2016)271–274.